## THE PLANETARY SYSTEM.

PROFESSOR YOUNG'S FOURTH LECTURE. A COMPREHENSIVE SUBJECT DISCUSSED IN AN HOUR AND A HALF,

The fourth of Professor C. A. Young's popular lactures on astronomy, delivered at the Church of the Strangers last night, was devoted to "The Planetary System." The locurer had the same large and attentive audience that heard the earlier lectures of the course, and he was greeted with a round of

Strangers last ingine, was decreased that years altery set of the course. The cluster had the same large and attentive andience that heard the earlier lectures of the course, and he was greeted with a round of applause when he steeped upon the platforn. He spoke an hour and a half, very rapidly, and covered a surprising amount of the ferritory, as he was compelled to do by the comprehensiveness of his subject. Before introducing the lecture Dr. Deems announced that on Thursday evening there would be in the lecture room of the chartch a meeting of the limitine of Christian Phicharch and Cometa.

\*\*HE LECTURE.\*\*

I ADDES AND GENTLEMEY: My subject to night its evening there would be and a half that belongs to the pattern of the platform of the course of the pattern to which our earth belongs and of which the reversal of the pattern to which our earth belongs and of which the pattern to which our earth belongs and of which the pattern to which our earth belongs and of which the same law very bright stars. If we go out the evening and that is what has given them toek made the cauchas and the shall not the next it another bright star to belonging to all health of the pattern to which our earth belongs and of which the same is not very far from the mention, and which the other stars preserved the remains and the stars and the same the pattern of the pattern o on record—even before it was seen.

Those bodies, along with the Earth, which Consenious

about the beginning of the sixteenth century showed to be a body revolving around the sun, constitute the main portion of our planetary system, and all of them inove around the sun in paths pretty nearly circular and pretty nearly on one level. And then, between the planet Mars and the planet Jupiter there is room for others, and there is ac-tually a group of 224 or 225 esteroids at present known ps fragments of some planet burst to places, and perhaps the material of another planet spoiled in th making-I don't know which. Then be-sides these bodies I have named, all except Mercury and Venus have moons and satellites of their own; the Earth having one, Marstwe, Jupiter four, Saturn eight, Uranus four and Neptune one, making a

atellite family of twenty.

These constitute the plane ary system, and it may be separated into two great classes as Humboidt grouped them—the terrestrial planets, resembling the Farth very

may be regarded as aliding bodies.

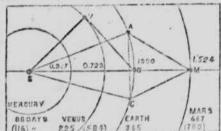
You must think of those orbits as not exactly fixed in position or in magnitude, but all the time disturbed, ila-ble to be swayed a little one way or the other, pulled around out of shape one way and squeezed up in another, and changing slightly by the action of the bodies upon each other. These orbits are very nearly, as I said before, circular; so nearly so that even if the most eccenture of them as the own of the count of the point of t centric of them was thrown on the screen you would hardly notice that it was not circular. Mercury is the most eccentric of them all. We should find that the

though they reached out arms and pulled upon each other, exactly as we might pull each other by a rope if in different boats upon a lake. Grant that one thing-gravitation-and all the rest follows. TWO FORMS OF ORBITS.

Now I will show you upon the screen how they act upon each other. Suppose a body here, and another starting from this point with a velocity no mat-ter what, we shall find that this body will move in relation to the other in a perfect curve, which, provided the velocity is not too great, will be an ellipse, this other body being in the focus of the clipse. If different hodies start from this same point, driven in different directions, but all with the same velocity, they will all come round



nessess decimal. The distance of Mercury is 4-10 that of the Earth, Venus is about 7-10, the Earth I, Mars 112 that will give you too distance of Jupiler; and then p outside of that the cube and you will get he dies as of Sauren. And so, as there were five regal solds-see how the tides of the time held their pos-over him !-so thore could be, he though; but two pla-ets. He believed that theory would arrange the d tances; but curiously ingenious as it is, we know th Uranus and Neptune exist, and that the law is not corre-



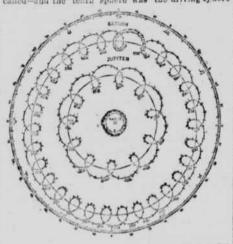


FIG. 111.—APPARENT ORBITS OF JUPITER AND SATURN of the whole, called Prinum Mobile, which was carried by some celestial machinery they knew not of, and which made all the reat move. Outside of all was the

who showed that the centres suppliers. Suppliers is spheres. Now, as to the relative sizes of the placets. Jupiter is curven times the diameter of the Earth; Saturn about mins times. The most recent measurements of Mercury make it from 3,000 to 3,300 miles in diameter. Mercury is, indeed, exceptional in all respects, its orbit being the most inclined to the Earth's orbit, the planet itself being the heaviest and densest of the induced in the system—in fact, nearly twice that

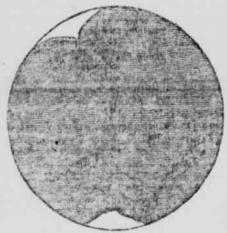
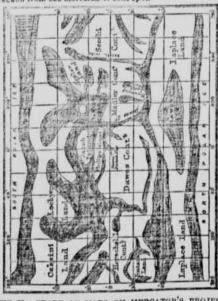


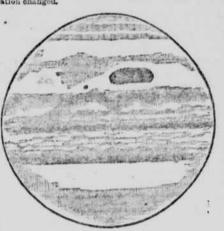
FIG. IV .-- TELESCOPIC VIEW OF MARS.

Now for our next neighbor on the other side - the planet dars. The orbits of the Earth and the planet are both circular, but the sun is not in the sentre of the orbit of Mars; it is considerably out. The consequence is that, as the planet goes around the sun and comes to its morest position to us, it is very different an different times. The diagrams show the opposition, as it is called, in different years. In 1877 the distance was thirty-six or thirty seven million miles. The next season when it cames rearest to us, it will be over fifty milition miles away. As the Earth goes around once a year and Mars follows once in about a year and two-thirds, it follows that they come late into which the planet rises at sun-civil tooks bright, and as the sarth goes around they get for their and further apart, and at the end of a year the planet is as in away as it can be, and it looks the altitle star. I don't think anybedy would notice it new, but if you want it as the meaths you nit will be continually growing brighter and bright runtil sometime next wince it will be opposited the san, and then will be very brill-hut indeed, though not so much so as it was in 1877, but course we can study its surface at the opposition when it course near to us. The peture which I throw on the series shows a good deal of detail. The bright the theory is represented by the planet. We know that there is vapor or water in the atmosphere of the planet in the next hole is they are continually recording the more and the planet on the south pole is tipped to the sum and at another time the south pole is tipped to the sum and at another time the south pole is tipped to the sum and at another time the south pole is tipped to the sum and at another time the south pole is tipped to the sum and at another time the south pole is tipped to the sum. We find some of the spats in the planet continually recording. You will find them some alpht; then the next high they are covered, and some other night you will find the same thing mails. Some of these markings pertaining to the planet coarse, and there are regions of cloud and shorm. So an observer in Mars looking Mars; it is considerably out. The consequence is

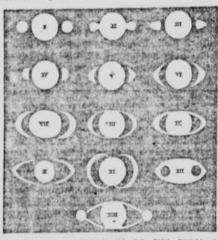


He also threw upon the screen a capy of the last chart of Maxamade by Schiagarelli as de incated early in 1882, which showed the singular nearsell markings that have been so much discussed as the "canals" on the planet. If was appropos of this that Mr. Protor made some very curious remarks, to say the least, on the planet entrement of the contract the chapter, until they got enough to represent the actual motion. It was this condition of things that led King Alphonzo, of Castle, to make the remark that if he had been present at the creation he should have given some good advice as to the complication of the system. [Lambiter,] The fact that the planets move in chipses clears that all up. Now as to the way in which that motion is produced, let me say here that the earth was placed in the centre, above it the first was placed in the centre, above it the hind supposed that motion to be produced was that there was a sort of crystalline sphere—a shell of glass, perfectly transparent—in which the moon is set. Beyond that would have to be, to be seen forty millions of indication, and the first was a sort of fixed stars; then came the ninth sphere, which produced what we call the procession of the equinozes—the "sphere of the trapidation," as it was called—and the tenth sphere was the driving sphere.

A since word about the satellite system of the planet ware so very small that it is a wonder that they were found in the seven and they are howed the singular parallel markings that have been so much discussed as the "canals" on the planet, about great engineering works and canals about great engineering works and canals on the planet, and they were discovered in the word in the war another shell moving without friction, and Mercury was inside of that, and then followed the circle of Venus, the Sun, Mars, Jupiter and Saturn. Then came the sphere of the north sphere which produced what we call the procession of the equinozes—the "sphere of the trapidation," as it was called—and the tenth sphere which produced what we call the procession of the equinozes—the "sphere of the repulation," as it was called—and the tenth sphere which produced what we call the procession of the equinoces—the "sphere of the repulation," as it was called—and the tenth sphere which produced what we call the procession of the equinozes—the "sphere of the very curious remarks, to say the least



Now we come to Jupiter. It is not quite round. Its surface is covered with belts. We see a stripe across the pisnet of purple, another of a brownish color, and



SATURN.

Next outside of that comes the planet Saturn. Here are some of the early drawings of the planet. Gailleo made a drawing representing it as triple; but instead of announcing his discovery, he took in Latin the statement: " I have found the outside planet triple," and then ment: "I have found the outside planet triple," and then arranged the letters, putting together all the a's, then all the b's, then all the b's, and so on, forming a loggraph, which he printed without telling what it meant; for the reason that some years before he had discovered snots upon the sin, and somebody else had published it before he had the opportunity to do so himself, and so he lost the creat of it, so he published his discovery in such a way that nobody could explain it; and he did the same thing in his discovery of the phases of the planet Mercury. But after a few years he was surprised to see that the balls had disappeared; and he said. "Has Satura cate out he children' referring to the old myth; for he did not know what to make of it. But by-and-by they came back again. Telescopes began to improve, and here is a drawing made by Heyelius; but it was not until 1650 that Huyghens made the true explanation, which he published in something the same



FIG. VIII .- SATURN AND HIS RINGS.

Here we see the planet with the appearance of its rings at different times. It is about 75,000 miles in diameter, and has belts like those of Jupiter, but not so conspicuous, and this mysterious ring. First there is an outer ring, which is divided into two by a line which we can almost slways see in the telescope at Princeton, but not invariably, looking like a light pencil line, and inside of that is what is known as the gauze or smoke ring, specially interesting to Americans from the fact that it was first discovered in this country by Bond at Cambridge. Dawes in England discovered it nearly as soon; so that the two steamers carrying the news across the osean crossed each other on the way. This is the appearance of the planet as it is seen mow; but the ring is in the plane of the planet's equator, and changes its inclusion to the sun precisely as the Earth does. At certain times the sun and Earth will be in the plane of the ring; so that we shall see it edgewise; that is, we shall not see it at all it is so very thin. As it goes around the sun in thirty years, it is fifteen years from the time when the ring is turned edgewise before it is turned edgewise again. That occurred in 1878; and in 1895 or 1896 tile ring will be as open as it is ever seen, for we can never see it circular. The planet saturn is only about one-suith as heavy as the Earth, in proportion to its size, being lighter than water, Jupiter is twice as dense; but Saturn is the only planet which, thrown into water, would float like a witch. As to the rings, nobody knows what they are but I can tell you what they are not solid. bridge. Dawes in England discovered it nearly as soon;

survey of a region ten degrees wide and twenty degrees long, intending to go over it and examine every star, going over it as econd and a third time, by which time the planet would have changed its position. He had gone over it once, and a second thes, stopping just a lew stars short of the planet, when the news came from Berlin that the planet was found. If he had kept on ten minutes longer he would probably have found it. But Levertier had gone to work in another way, very much like a Frenchman. He wrote to Gaile, in Berlin, teiling him that his computations said the planet ought to be in such a place—"you will find it within a degree of that place, and you will know it by its disc." Gaile, with the Berlin telescope, nine make in diameter, looked for it, and surrenough, within that an bour, there it was. Gaile at once called up Encke; and i have heard Brunnow, who was then an existent in the observatory, give an account of it. When Encke looked through the telescope and saw she planet he exclaimed: "Mein dot!" is to do moglien? "My God, is it possiole?" A planet discovered bofore it was secu, by its effect upon the motions of another.

Gennests of the Solar System.

and La Piace, a century age, with some modifications, is substantially correct. It is the theory that in the first place all planetary space was filled with a nebular mass of cloud and dust mingled together like smoke, particles of matter mingled with gas, probably not of uniform density toroughout, for there seems to be no reason why it should be and extending beyond the orbit of the most distant planet. I cannot say where that sincke came from. I cannot go back beyond that point, even upon this theory. It was made surely at some time. The effect of gravitation upon such a mass of matter, then, in the form of a roughly globular imp, such as the mebular we find now existing in the sky, concentrating the mass, would be, unless the modion was precisely towards the centre, to produce a vortical or whirling morion; such as you see when the water is escaping from a washowl. The least want of symmetry will produce a whirling motion. The result will be first that the temperature will rise, as the mass is condenseed, in the next place the whirling mass will become oval. La Piace said that afterwards no central body would be surrounded by rings. A very practy experiment has been devised to illustrate that. A buil of oil is suspended in a mixture of water and alcohol, in such proportions that the density is precisely that of the oil. The bail is made to rotate, and will expend and if you strike it, little pleeds will simp off; or if it is turned with sufficient earth will being out and gradually form a ring like that of Satura, which will circle author if the list is in the sum of the planetary system was formed in a similar way; the solar mass extending at first beyond the order of the olds. It is like that of south of the olds, it is like that of south of the olds. It is necessary to suppose some changes in this mode of action; for otherwise the means of Mars never could revoive quicker than the rotation of the planet fracif. Yet something like this may be the correct theory.

One word as to the stability of the system and La Pince, a century age, with some modifications, is sub-initially correct. It is the theory that in the first

## CAPTURE OF A CLEVER FORGER.

Detective-Sergeants Williamson and Von Gerichten on Monday night arrested a clever forger, in a liquor shop in Twenty-seventh-st., near second-ave.,

Detective-Sergeants Williamson and Von Gerichten on Monday night arrested a clever forger, in a liquor shop in Twenty-seventh-st., near second-ave, who is wanted for obtaining from the City National Bank of Dalias, Tex., 86,100 on a bogus check on the Park National Bank of this city. He was inched up in Yolice Headquarters, where he gave his name as John Stewart. At first he stoutly denied his guit, Yesterday he was taken to the Jefferson Market Court and remanded.

The swinder went to Dalias in November under the name of George Coleman, taking letters of introduction from the cashier of the Exchange National Bank of Norfolk, Va. He began his operations by depositing in the Dalias Bank a craft for \$3,300 on the National Bank of Norfolk, which was dirly honored. On December 16 Coleman presented his draft for \$9,500 on the Park Bank of this city. He drew \$6,100, as the signature seemed genuine. It was soon learned, however, that the draft was a clever forgery, but in the meantime Coleman had left Dalias. His description was furnished the police of this city, in which it was stated that he had blue India-ink marks on the back of his left hand. The man was first seen by Detective Radford about two weeks ago in a liquor-shop at Greenwich and Dev-sts, in company with George Hardgreaves, a well-known counterfeiter and forger. After being shadowed for a few days he disappeared, but was seen again in company with Hardgreaves and George Witss, a notorious criminal.

Detectives Cosgrove and Williamson were then detailed to watch Coleman. They followed him about the rotanda of the Aster House, the Fost Office, and wherever he lounged during the day. He always were gloves, and the delectives were not office, and wherever he lounged during the day. He always wore gloves, and the delective a seat in the row ochind him. During the performance the forger removed his gloves and the detective caught sight of the blue marks on the back of uis left hand. The officer got up, and going around to Polee Headquarters he reported his dis Atthough Coleman defiled his guilt at first, he subsequently acknowledged to Inspector Byrnes that he was the forger. He will be taken into court again to-day. Mr. Connor will appear against him, and he will be held to await the arrival of the sherilf of Dallas County, with a requisition.

## PRESENTS TO A HISTORICAL SOCIETY.

At the bi-weekly meeting of the Long Island Historical Society in Brooklyn last evening, a lecture upon "The Colonial Spirit in the History of the United States" was delivered by Henry Cabot Lodge, of Boston. The lecturer said that after 150 years of dependence the colonies separated from the mother country, but with all the ideas of dependence upon her. It was not

THE STATE LEGISLATURE.

MEASURES BEFORE BOTH HOUSES.

PROTECTION FOR ADIRONDACK FORESTS-A ME-MORIAL FROM THE EMIGRATION COMMISSION-ERS-BILLS INTRODUCED.

FROM THE REGULAR CORRESPONDENT OF THE TRIBUNE.

ALBANY, Jan. 23 .- A first step was taken by

the State to-day toward protecting the wast forests of the Adirondack wilderness. The Senate passed by a large majority Senator Frederick Lansing's bill forbid-ding the sale of the 660,000 acres owned by the State in the Adiron tack region. There is no manufacturer the wheels of whose factory are driven by the streams flowing out of the wilderness, no lover of fine scenery or seeker after health who has en-loyed the Adirondack woods, who will not hope that the Assembly will treat Schalor Lansing's bill with the same favor that the Senate has extended to it. The forests of the Adirondack region are now menneed with forests of the Adirondack region are now menaced with destruction as they never have been before. The rapid outting away of the forests of Michigan and Minnesota has turned the attention of the lumbermen to other forest regions, yet comparatively untouched. The Adirondack woods naturally have come under their view. For years these woods have been protected from the axe by the difficulty of getting the logs that might be cut to market. There are few streams of sufficient depth in the region to float the logs. This has compelled the lumbermen to haul such of the logs as they cut to the nearest railroad, often miles away. The expense of ruls method of transporting the logs has been so great that it has virtually prohibited the desiration of the woods. Within the past year, however, several streams penetrating the Adirondack region have been deepened, one at the expense of the State, so as to permit of logs being floated upon them. This would of itself increase lambering in the region. Roads also have been improved and ing in the region. Roads also have been improved and railroads somewhat extended. Lumber also has advanced in price. It is apparent that the removal of the obstacles to successful lumbering and the increase of the price of lumber are tempting the woodmen to buy the Adirendack forests. Recently, Senator Lausing stated, a firm of lumbermen bought 23,000 acres of haavily timbered land in the region, and he had just heard of negotiations for 26,000 scres more.

There was a little opposition made to the bill by Senator Lynde, of St. Lawrence County. He moved that it

In the solar system; for it is a system. One theory is that they solar system; to go over it as econd and a third time, by which time the planet would have changed its position. He had gone over it once, and a second time, stopping just a lew stars short of the planet, when the news came from Berlin that the planet was found. If he had kept on ten minutes longer he would probably have found it. But Leverrier had gone to work in another way, very much like a Frenchman. He wrote to Gaile, in Berlin, telling him that his computations said the planet ought to be in such a place—"you will know it by its disc." Gaile, with the Berlin telescope, nine makes in diameter, looked for it, and sureenough, within limit an hour, there it was. Gaile at once called up Encke; and i have heard firmnow, who was then an assistant in the observatory, give an account of it. When Encke is not in the closer of the solar system; for it is a system. One theory is that it is good to have a system, and so it was made in that way outright. Another theory, more generally held, is that it grew out of some previous condition. I believe that the theory called the nebular hypothesis, suggested about the same time by Kant and La Pince, a century age, with some modifications is sub-tantially correct. It is the theory that in the first

sioners had been compelled to draw from the \$200,000 more than the \$90,000 which they had promised not to exceed.

Senators Jacobs and McCarthy, the leading men of the Senate Finance Committee, opposed the acceptance of the apology. They were finally of the opinion that the Governor and the Legislature had been intentionally deceived by the Emigration Commissioners. Senator Jacobs charged that the Commissioners had been affored sufficient money for certain privileges in Castle Garden to have enabled them to avoid breaking faith with the state. In conclusion be urged the passage of the bill depriving the Commissioners of the power of drawing out of the Sato Transury any more money of the \$200,000 appropriated than they have already obtained. Senators Daily and Grady protested against the passage of the bill; saying that if it became a law the Commissioners might be compelled to close thate Garden. Their protests were no, heeded, the bill being passed by a large majority.

Senator buly introduced a bill to-day abolishing the offices of Captain of the Port and Harbormasters of New-York. In their place he substitutes eight officers to be known as "whartingers," was are to be appointed by the Dock Commissioners of New-York. These whartingers are to do all the work now done by the Harbormasters in regard to assigning vessels to berths. They are to be paid a sainty, and are forbidden to take fees under penalty of being deemed guilty of a mosdeneator.

Assembly man Keyes presented a bill forbidding the object of the bill is to destroy the present contract-labor system of the Prisons. He trankly aknowledges that the object of the bill is to destroy the present contract-labor system of the Prisons. He trankly aknowledges that the object of the bill is to destroy the present contract-labor system of the Prisons.

Senator Koch's bill changing the name of the "Marine Court" of New-York to the "City Court " was passed by the Senate.

Assembly man McCarren, of Brooklyn, introduced a bill reorganizing the Board of Education of

[FROM THE REGULAR CORRESPONDENT OF THE TRIBUNE.] hope to force a vote to-morrow on the nomination of John O'Donnell for Railroad Commissioner. To-day Senator Grady gave notice that he should move to-morrow that the rule of the Senate which requires secret executive sessions be suspended for the day. In other words, he intends to make a motion that the public snail confirmation. This is an indirect form of "pressure" on such Senators as are opposing O'Donnell's confirmation. The Anti-Monopolists argue that those Senators will not dare to oppose O'Donneli's confirmation publicly, although they will do so ear-nestly if the doors are closed. It is expected that the letters which O'Donnell wrote to the merchants of Utica while the Railroad Commission law was pending will be road. His opponents hope that these letters will secure

read. It is opponents hope that these letters will secure his rejection.

Senator Boyd apparently has detected that the railroad companies are using their influence in the Senate concerning the Railroad Commission. To day he presented the following resolution, which was tabled:

Resolved, that the Committee on Railroads of the Senate he instructed to investigate and report to the Senate he instructed to investigate and report to the Senate he instructed to investigate and report to the Senate has soon as practicable was there any officer, agent, as been in Albany during this session of the Legislature to secure the appointment, confirmation or rejection of any Railroad Commissioner, and whether any railroad has pussed any such person or persons for such purpose free over their roads; the committee to have power to send for persons and payets.

THE WORK OF COMMITTEES. Albany, Jan. 23 .- Senator Pitts's bill abol-

shing the office of Canal Auditor will be reported favorably by the Senate Canal Committee. The Assembly Committee on State Prizons will begin the investigation into the management of Sing Sing Prison at the Astor House, New-York, on Friday at 10

A hearing will be given by the Assembly Committee on Commerce and Navigation on Tuesday next on Mr. Cary's bill abelishing the offices of Captain of the Port and Harbor-Musters of the Port of New-York.

The Senate Railroad Committee will report favorably Senator Treamor's bill compelling the cievated railroads on the west side to run trains all night. Messrs. House, Crane and McMaun trains all night. Massers. House, Crame and Memana appeared before the Assembly Railroad Committee and argued in favor of 5 cont fares on the New-York elevated railroads. The committee unanimensly agreed to report the bill favorably to the Assembly. Senator Koch's bill produtiting pool-selling except upon race tracks will be favorably reported by the Senate Judiciary Committee. This committee will also report favorably Senator Titus's bill establishing a Court of Claims and abolishing the Board of Audit and Canal

THE SUIT AGAINST THE METROPOLITAN ROAD.

ALBANY, Jan. 23 .- The decision of the Court of Appeals in the case of the New-England Iron Com-pany, appellant, as just the Gilbert (Metropolican) Elevated Railway Company, respondent, was handed down to-day. The decision says in part: "Notwith standing the arguments addressed to us both orally and in writing, by counsel for the defendant, we find it im-possible to say there was not a question for the jury which, if answered by them in favor of the plaintiff, would have required an assessment of damages for the breach of contract set forth in the complaint. . . . If the corporation was not in fact, dissolved, as itclearly was not, if not relieved from the obligation of the contract, and this we hold, then upon the whole evidence which might be produced by the parties it was for the jury to might be produced by the parties it was for the jury to say whether the piaintiff was able and ready and will-ing to execute the contract and. If it was, then whether, by the defendant's violation of it, the plaintiff sustained damages. As to the evidence aircady in, we fortean comment. As the case now stands, it was not properly disposed of at the Circuit. The judgment appeared from should therefore be revorsed and a new trial granted, with coars to abide the avent. Opinion by Dan-forth, J. All concur.

## ANXIOUS TO END TARIFF AGITATION.

PHILADELPHIA, Jan. 23 .- At a meeting of thePhiladelphia Association of Manufacturers of Textile Fabrics a resolution was adopted to-day urging upon Congress the necessity of ending the tariff agitation by congress the necessity of ending the tariff agitation by the passage at once of the Tariff Commission bill as amended by the Ways and Maans Committee. The resolution declares that the uncertainty in regard to legislation upon the subject injures the manufacturing interests of the country and that 10,000 hours are idle and 20,000 persons out of employment in the city in consequence of the inability to forceast the course of legislation.